

## **ABSTRACT OF THE INVENTION**

The present invention relates to a Rn<sup>222</sup> (radon) and Rn<sup>220</sup> (thoron) radiation monitor that uses alpha-track detection film in multiple, separate chambers to detect radiation. The invention further describes use of different diffusion barriers in each of the chambers to allow for signal differentiation between the chambers. The signal differentiation allows for differentiation between the levels of thoron and radon in the atmosphere tested. In a preferred embodiment of the invention, the radiation monitor has three or four separate chambers, each with an electrically conductive housing and a cap with at least one opening to permit entry of ambient air. Inside each of the housings is an alpha-track detecting film, such as a solid-state nuclear track detector (SSNTD), with a thin electrically conducting cover. In one or more of the chambers is a diffusion barrier and seal placed within the housing to generally isolate the detecting film from thoron radiation in the housing. Use of diffusion barriers with different diffusion rates or properties allows for signal differentiation so that a specific measurement can be made of thoron levels separate from the radon levels present in the atmosphere tested.